

Chapter III

RECREATION FACILITY DESIGN CRITERIA

These recreation design guidelines often exceed minimum dimensions and standards. The guidelines are based on experience and best design practices for current recreation facilities and users.

- A. Entrance Station:** The entrance road to a recreation area should be nearly level with the primary road, so that maximum safety and minimum grading can be achieved. It is recommended that the entrance station be located on the road that leads into the recreation area and at least 150 feet off the primary road.

All new or rehabilitated entrance areas must be accessible¹ and may include the following features:

- At least two incoming traffic lanes
- Parking spaces for at least two cars, one of which should be a van accessible parking space
- Sidewalks, including an accessible route
- Informational signs
- A self-service fee depository
- Overhead site lighting
- Vehicular turnaround space both inside and outside the entrance station
- An outgoing traffic lane

Traffic lanes in the area of the entrance station should be a minimum of 12 feet wide. Sidewalks should be a minimum of 6 feet wide and must be accessible. Signs, lighting, and the fee depository should be located adjacent to the accessible route. Sidewalks should be cross sloped at a maximum of 1.5 percent. Entrance area lighting should be provided at a level appropriate for safety.

¹ The term “accessible,” as used throughout this document, means to be usable by persons with disabilities and in compliance with UFAS and ADAAG.

Self-Service Fee Depository.—The fee depository will be designed for self-service and be completely accessible. It will include an accessible writing surface with a midline height 30 inches off the ground and a fee slot 34 inches off the ground. (See Appendix A - Entrance Station.)

B. Camping Facilities:

1. Campground Layout.—Each campground layout design should be reviewed onsite to ensure that grade transitions can be accomplished smoothly and without costly postconstruction remedial efforts. When siting the roads in a campground, full consideration should be given to esthetic factors and site topography, as well as cut and fill balances. It is important that proposed field changes be approved by the appropriate designers. In all cases, picnic grounds and campsites should be sited with the emphasis on safety and program goals.

- Comfort stations should be sited so that trampling and erosion impacts, as well as intrusions on other campsites, are minimized. Reasonable effort should be made to provide vegetative screening at those campsites nearest the comfort station to maximize privacy and minimize disturbance from the activities at the comfort station. Each comfort station must provide a minimum of two parking spaces, including one accessible space.
- Lighting within a campground should be low intensity and provide illumination only where necessary for safety. Lighting at comfort stations should illuminate only the external sidewalks or nearby ground surface.
- Each campground should have a permanent display that contains a site map or plan that effectively communicates site layout, accessible features, and items of interest and their relative locations. The map must be in compliance with ADAAG. All facilities within the campground, such as comfort station, parking lot, and accessible campsite, as well as places of interest, are to be linked by an accessible route.
- Accessible campsites are to be dispersed throughout the campground.

2. Campsite Parking Spurs.—Two preferred types of campsite parking spurs are back-ins and pullthroughs. Single-width parking spurs should be 14 feet wide, and double-width spurs should be at least 22 feet wide. Parking spurs should be constructed of compacted road base, asphalt, or concrete. The minimum parking spur length should be 60 feet, to accommodate a trailer, plus a towing vehicle such as a car or truck. (See Appendix B - Camping and Picnicking Facilities.) Back-in spurs that require a change in grade from the main road of more than a few inches should be avoided.

- a. **Back-In Parking:** Back-in spurs may be located on either side of a one-way road, but preferably on the left side for driver's side visibility. Back-in spurs may vary in length to accommodate site features. The preferred spur-to-road

angle for back-in is 30 to 45 degrees, as measured from the road. Back-in spurs should not exceed 60 degrees. (See Appendix B - Camping and Picnicking Facilities.)

- b. ***Pullthroughs Parking:*** Pullthroughs should be located only on the right side of the road. Pullthroughs should be a minimum of 100 feet long. (See Appendix B - Camping and Picnicking Facilities.)
- c. ***Accessible Campsite Parking:*** Recreational vehicle parking spaces at accessible campsites are to be a minimum of 20 feet wide and should slope no more than 1.5 percent. Additional parking spaces at an accessible site will be at least 13 feet wide, which includes a 5-foot-wide aisle.

3. Campsite Layout and Components.—The living area of each campsite should be located to the right or rear of the parking spur. This location is preferred because the doors of recreational vehicles are on the right side (passenger side of the vehicle) when facing the direction of traffic flow. Each campsite is to include a picnic table and a fire ring and/or pedestal grill on a surfaced living area. Pedestal grills are optional at basic campsites but required at accessible campsites. Highly developed facilities in hot, shadeless areas that service a large number of visitors may feature shade shelters for campsites. It is recommended that at least half the campsites accommodate a tent space, either included within the designated overall living area or separate but associated with the site's larger living area.

- a. ***Living Area and Tent Pads:*** A campsite living area that includes tent space is recommended to be a minimum of 800 square feet, including a square tent pad that should be at least 144 square feet. A living area that does not incorporate a tent space is recommended to be 650 square feet. Living areas and tent pads should be constructed of compacted sand (or aggregate road base) over landscape fabric over compacted earth. Living areas and tent pads should be sloped 1.5 percent to drain. See paragraph B.3.d. on fire rings below for surfacing requirements of the living area over and immediately surrounding the ring. (See Appendix B - Camping and Picnicking Facilities.)
- b. ***Picnic Tables:*** The table should be of heavy-duty construction. The recommended length is 8 feet and should meet accessibility standards. For longest life and least maintenance, it is recommended that tables be constructed of all concrete or all metal.
- c. ***Pedestal Grill:*** The grill should be located at the edge of the living area and downwind from the table. The grill should be installed to avoid any fire hazards. It is recommended that the cooking surface of the pedestal grill be large enough for a camp stove to be set upon it and be stable. The grill is to be installed so that the cooking surface is not more than 34 inches above the living area surface. While not required for nonaccessible campsites, it is recommended that the clear and maneuvering space required by UFAS and ADAAG be used. (See Appendix B - Camping and Picnicking Facilities.)

- d. **Fire Ring:** It is recommended that the fire ring comply with ADAAG. The fire ring should be within the living area and downwind from the table during the prevailing evening winds to avoid fire hazards and minimize smoke in the living area. The clear space may allow wheelchairs to pass as well as provide room for seating. In all cases, the ground surface under the fire ring and for 2 inches beyond the edge of the fire ring is to be of compacted road base or gravel, but never concrete, due to the danger of extremely hot concrete exploding. (See Appendix B - Camping and Picnicking Facilities.)
4. **Accessible Campsites.**—All accessible campsite components are to comply with the requirements of ADAAG and UFAS and are to be connected to other campground features by accessible routes.



Accessible campsite - Ridgway State Park, Colorado.

An accessible campsite will include a table, a raised tent pad, a pedestal grill on a concrete living area, an accessible parking space, and access to an accessible water hydrant or water spigot in a splash basin. It is recommended that the living area be a minimum of 800 square feet, which includes, within its limits, a minimum 12-foot by 12-foot elevated tent pad. The tent pad will be surrounded on all sides by a 4-foot maneuvering space. The elevated tent pad may be constructed of wood or concrete. The tent pad is to have a compacted gravel surface 15 inches above the surface of the living area. The surface of the tent pad should be sloped to drain, but not more than 1.5 percent.

A pedestal grill should be between 5 and 6 feet away from the end of table. (This distance is important because it enables hot pots to be transferred from the grill to another surface without traveling in a wheelchair.) The grill should be located within the edge of the living area with a 5-foot clear space around all approachable sides. Inclusion of an accessible fire ring is optional. When a fire ring is used, it should be located near a corner of the living area, with a 4-foot-wide clear space around all sides. The fire rings are not to be set into concrete because of the danger of the concrete overheating and exploding. Clear spaces around the grill and fire ring are to be surfaced with a detectable warning² to alert a visually impaired person.

The living area should be sloped 1.5 percent to drain. A 20-foot-wide by 40-foot-long concrete, asphalt, or compacted gravel parking space is to be located adjacent to the living area. Parking stops separating the living area from the parking space are to be a minimum of 6 feet apart. See paragraph B.2.c. “Accessible Campsite Parking,” above. (See Appendix B - Camping and Picnicking Facilities.) In addition, the interface of the living area or parking space with surrounding soil should be smooth, with no more than a ½-inch grade change.

5. Campground Utilities.—Utilities in campgrounds may be provided in various combinations and locations and should be accessible as required.

- a. **Electricity:** When electricity is provided to a campsite, it should be provided in a covered and grounded electrical box that is mounted to a post or in a manufactured assembly that includes a ground fault interrupter. The post should be located on the driver’s side of the parking spur at a point 0 to 15 feet from the rear of the spur. The post, as well as other manufactured electrical boxes, should be protected by a steel guard post located 18 to 24 inches away, on the side nearest the road. Guard posts should be 4 to 5 inches in diameter and filled with concrete. Warning tape should be placed in the trench above the electric lines. Electrical facilities at each campsite should be sized to comply with National Electrical Code, Section 551 G.
- b. **Water:** Water provided should be from a water hydrant or water spigot and installed in a splash basin. Hydrants and spigots located along a campground access route or at an accessible site should have a 5-foot-wide accessible approach apron located adjacent to one side of the splash basin. The approach apron is to be flush with, and constructed of, the same material as the access route. In instances where both a drinking fountain and a water hydrant or water spigot are provided at the same site, both features should share the same splash basin and underground supply lines, if feasible. (See Appendix B - Camping and Picnicking Facilities.)

When water alone is to be provided to a campsite, the splash basin should be located no closer than 5 feet from the road, in the vicinity of the general living area of the site.

² A detectable warning surface is colored or textured differently than the surrounding ground surface to alert a visually impaired person of a nearby danger, such as traffic or fire.

When water and electricity are both to be provided at a campsite, the hydrant or spigot should be located on the driver's side of the parking spur at a point 15 feet from the rear of the spur. Guard posts should be installed as described above. The water line and electrical line should be installed in the same trench when appropriate, according to codes, and there is to be a warning tape just above the electrical line.

- c. ***Sewer Hookups:*** When water and sewer hookups are located at the same spur, the two hookups should be separated by at least 8 to 10 feet, with the sewer line located 5 to 7 feet from the rear of the spur. (See Appendix B - Camping and Picnicking Facilities.)

C. Picnicking Facilities:

- 1. **General Description.**—Picnic sites should include a picnic table and a pedestal grill on a hard surface area. Picnic use areas should be a minimum of 600 square feet. (See Appendix B - Camping and Picnicking Facilities.) The use area should be sloped 1.5 percent to drain. The toilet facility should be located convenient to the picnic sites. A recommended distance is within 300 feet of the parking area.

- 2. **Picnic Site Components.**—

- a. ***Picnic Tables:*** The table should be of heavy-duty construction. It is recommended that it be 8 feet long and should meet accessibility standards. For longest life and least maintenance, it is recommended that tables be constructed of all concrete or all metal.
 - b. ***Pedestal Grill:*** The grill should be located at the edge of the use area and downwind from the table. The grill should be installed to avoid any fire hazard. It is recommended that the cooking surface of the pedestal grill be large enough that a camp stove could be set upon it and be stable. The grill should be installed so that the cooking surface is at a maximum height of 34 inches above the use area surface. (See Appendix B - Camping and Picnicking Facilities.)
- 3. **Accessible Picnic Sites.**—All accessible picnic sites are to comply with the requirements of ADAAG and UFAS. Accessible picnic living areas should be paved with concrete, asphalt, or decomposed granite and sloped 1.5 percent to drain. (See Appendix B - Camping and Picnicking Facilities.) It is recommended that a picnic site be with 150 feet of an accessible parking space.

D. Trailer Dump Stations: Trailer dump stations should be located near the recreation facilities. The station must be located so that there is no chance of infiltration of flood waters into the storage tank or seepage out of the storage tank.

The trailer dump station should include an area for disposal of stored sewage, a source of water to flush out sewage holding tanks, and a separate source of potable water for filling vehicle storage tanks. The station should be sited so that it is usable from the left (or driver's) side of the vehicle. The immediate area surrounding the drains should be paved and sloped 2 percent toward the drain. A clear space of at least 5 feet around the drain shall be maintained. All controls that operate the station are to be between 9 and 54 inches off the ground and be operable with one hand with not more than 5 pounds of force. The potable water source should be separated from the tank-flushing water source according to local code requirements. (See Appendix C - Trailer Dump Stations.) Signage is required to distinguish between water supplies.

E. Comfort Station Buildings:

- 1. Siting Considerations.**—All new comfort station buildings are to conform with the requirements of ADAAG and UFAS. For a discussion of prefabricated concrete vault toilet buildings, see paragraph E.8., “Prefabricated Vault Toilet Buildings,” later in this chapter. In selecting a site, a number of factors should be considered. Sunlight, breezes, and topography can be used to produce natural heating and cooling effects. The existing vegetation can be used to control sound, screen undesirable views, control erosion, and provide esthetic interest.

The location of the comfort station will depend on the recreation activity it serves. A comfort station should not be located at the top of a boat ramp, but within a reasonable distance. It should also be within a reasonable distance of the associated parking for the boat ramp. In a picnic area, the comfort station should be located within easy walking distance of all picnic sites and is recommended to be within 150 feet of an accessible site. In a campground, the comfort station should be located to maximize use of site connecting trails, while minimizing soil erosion, negative environmental impacts, and the formation of new trails. New comfort station buildings should be located on an accessible route that serves all the features of the site, such as the parking lot and picnic sites.

Restrooms must be located so that there is no chance of infiltration of flood waters into the restroom.

- 2. New and Rehabilitated Comfort Station Buildings.**—The standard plans shown in Appendix D - Comfort Station Buildings are fully accessible. The recommended floor plans delineate space allocations, functional layouts, and configurations of facilities. New and rehabilitated buildings should blend with the surrounding landscape and existing buildings in elevation, material, and color. Prior to color selection for the building, a color board should be assembled with samples of the site's soil, rock, and vegetation. Colors for buildings should match the color board. Building materials should reflect what is readily available in the region, considering both cost and esthetics.

All new and rehabilitated buildings are to conform with local building codes.

Existing comfort station buildings that do not meet accessibility standards should be evaluated to determine if they can be rehabilitated and made accessible. (See Appendix D - Comfort Station Buildings.)

- 3. Preferred Comfort Station.**—The preferred comfort station shown in Appendix D - Comfort Station Buildings is a four-unit building, with two water closets (toilet stalls) on each side. As additional fixtures are required to meet user needs, the length of the building can be increased by adding one or more water closets to each side. Toilet facilities for both men and women include one accessible water closet. There is a unisex room, with separate entry, provided for special needs use or for family groups. This room includes an ample-sized counter, suitable for changing diapers. All fixtures in the unisex room are accessible. As an option, the toilet in the unisex room may be installed as a composting or vault toilet, which would provide toilet facilities in cold months when water to the building is turned off. The building features a covered entry with an outdoor drinking fountain and a hose bib for maintenance use. A pipe chase, located in the middle of the building, is accessed from the rear of the building. As an option, a utility sink may be located in the chase. Inside the building, along the inside walls, a trench floor drain provides necessary drainage without impeding accessibility. Interior areas are intended to be well lit and ventilated by clerestory windows and louvers. Interior walls have vandal-resistant finishes. Windows and lighting covers should be made of high-impact resistant polycarbonate resin. The screen walls, roof overhangs, and columns are optional.

4. Fixtures.—

Men:	two lavatories (sinks), two water closets (toilet stall) (one accessible)
Women:	two lavatories, two water closets (one accessible)
Unisex:	one lavatory, one water closet (all accessible fixtures)
Chase:	one utility sink (optional)
Exterior:	one drinking fountain (accessible)

- 5. Comfort Station with Shower.**—Showers are provided as an addition to the basic comfort station building. The building with showers features two separate unisex accessible showers in their own separate rooms. The shower rooms are separate from the rest of the building, with entries located on each side of the building. Five-foot-wide accessible concrete walks connect the front covered entry to the shower entrances. (See Appendix D - Comfort Station Buildings.)

6. **Comfort Station with Showers and Laundry Facility.**—Laundry facilities are provided as an addition to the basic comfort station building. This type of building is designed for recreation sites with high visitation, where the average length of stay is several days. This building provides toilets, showers, and laundry facilities. The laundry facilities are located at the rear of the building and are accessed by a separate covered entry. The washer and dryer are front-loading accessible models. Showers are separate from the rest of the building and are located on the sides of the building.



Comfort station and shower building - Jordanelle State Park, Utah.

7. **Recommended Materials and Construction Methods.**—The wall section shown in Appendix D - Comfort Station Building indicates recommended materials and construction methods; however, individual building construction is subject to the requirements of Reclamation design guidelines and local building codes. Regional climatic differences and local soil conditions will determine the specific requirements of the roofing system and foundation. Experts in building design should be consulted for those requirements.
8. **Prefabricated Vault Toilet Buildings.**—Prefabricated vault toilet buildings should be made of concrete. All walks are to comply with ADA guidelines and are to drain away from the building at a slope of not more than 1.5 percent. The building should be oriented for unobstructed solar heat gain to the vent pipe(s) that is (are) located on the outside of the building. For the building's sweet smelling technology to work, there must be a positive upward draw through the vents, which is dependent on their solar heat gain. Therefore, it is important to orient the building with the vent(s) on the south side. In addition, if the building is located in a very hot climate, its roof must be insulated to ensure the proper air currents and functioning of the sweet smelling technology. (See Appendix D - Comfort Station Buildings.)

Vault toilet buildings should feature obscure windows of vandal-resistant materials, such as polycarbonate resins. The access to the building and the interior of the building must be fully accessible. Whenever a single vault building is used, it is to be signed as unisex. The buildings are always to be signed accessible. In remote areas or areas where it is not feasible for a pump truck to service the building, the designer should consider selecting an organic composting toilet building as an alternative to a vault toilet building.

F. Boating Facilities:

- 1. Marinas.**—All marinas should be of a free-floating dock design. The marina will clearly state the largest size vessel serviceable by the marina. Maximum overall vessel length is to be measured to include all swim platforms, bow sprits, anchor ports, slides, masts, ladders, etc., in their fully extended position. Marinas are to have at least 1-1/2 parking spaces per slip.

- a. **Marina Location:** All new marinas should be located in areas providing sufficient water depth to allow vertical adjustment of the marina to meet the annual fluctuations of the lake level. Marina sites that require excessive horizontal movement to acquire sufficient depth or bathymetric contours for safe, efficient marina operations are not acceptable. In addition, all new marinas and marinas considered for enlargement must be sited where there is sufficient land area for proposed or reasonably expected support facilities, such as parking (including reasonable expansion of parking), a merchandise and fishing supply store, fuel, food, beverage, overnight accommodations, nearby campgrounds, and an ample road network.

Minimum water depths for location of a marina (at low water level) are 9 feet for marinas serving only powerboats up to 65 feet long and 15.5 feet for marinas serving both powerboats and sailboats up to 65 feet long.

- b. **Entrance Channel:** The channel is to be at least 100 feet wide at full control depth. The depth of the channel is to be equal to the deepest draft of a potential user vessel plus 5 feet at low water elevation. For a marina servicing powerboats and sailboats up to 60 feet long, the channel needs to be 15 feet deep at low water, and deeper if wave action is expected at the site. The channel is to be clearly and sufficiently marked with “No Wake” marker buoys, in accordance with U.S. Coast Guard Navigation rules.
 - c. **Perimeter Protection:** The perimeter of the marina is to be protected from wave action by a floating wave attenuating device, otherwise called a breakwater. The breakwater is to be marked with navigational lights and “No Wake” marker buoys, in accordance with U.S. Coast Guard navigation rules.



Tire breakwater - Glen Canyon National Recreation Area, Arizona.

An effective, low-cost, low-maintenance breakwater can be constructed from truck tires of the heavy “Euclid” type. The tires, 24 by 56 inches or 27 by 49 inches, enclose encapsulated foam and are cabled together to form a chain. The desired length can easily be floated into position and anchored to provide optimum wave attenuation.

- d. ***Floating Docks and Facilities:*** Docks should be of a floating design that adjusts to reservoir elevation and is easily removable in winter ice conditions or of a freeze-resistant design.

All floating facilities, such as sewage pump-out stations and floating comfort stations, should be a minimum of 16 feet wide and marked with navigational lighting in accordance with U.S. Coast Guard regulations.

- e. ***Critical Marina Dimensions:***

- (1) ***Berth Length:*** Berth length should be equal to the length of the longest boat designated for slips of equal length. Boat length is identified in paragraph F.1., “Marinas” above.
- (2) ***Main Dock Width:*** The main dock width is to be a minimum of 8 feet.

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- (3) ***Finger Float Width:*** Finger float width is to be equal to 10 percent of the finger float length, but not less than 3 feet.
 - (4) ***Fairway Width (Waterway between the slips):*** The width of marina fairways is to be 1.75 times the length of the longest boat that may use the marina. No boat is to be allowed to dock in a berth so that it extends beyond the end of the berth into the fairway, thereby creating maneuvering difficulty for other boats.
 - (5) ***Fuel Dock Width:*** The service area width of the fuel dock is to be a minimum of 12 feet.
 - (6) ***Float Freeboard:*** Floating docks are to have a freeboard ranging from 12 inches to 24 inches. If dock freeboard exceeds 12 inches, safety ladders are to be strategically placed every 100 feet along the main dock.
 - (7) ***Accessible Boat Slip:*** Finger float or piers leading to an accessible slip are to be a minimum of 5 feet wide.
- f. ***Construction Materials:*** Only materials that are impervious to water should be used in marina construction. Flotation structures for docks should be constructed of either polyethylene or urethane foam, supported by steel structural members (or all steel containers). Airtight steel containers, bolted together to form the main structural support configuration, will provide the framework for a strong, stable, low-maintenance marina. Finger floats and catwalks can be attached to the main walkway and supported with encapsulated foam. Decking should be of concrete or fiberglass. If the decking is concrete, it is to have a nonslip-textured surface. The most effective and long-lasting deck material is made of fiberglass and is available in standard size 4-foot by 8-foot by 3/8-inch sheets in a variety of colors. Dock fenders, sideboards, and freeboards should be of plastic lumber material. Wood is accepted only for use as cosmetic accent pieces; treated timbers should not be used.
- g. ***Dock Hardware:*** Cleats should be 12 inches long, made of galvanized steel, and bolted through the structural member of the dock. The bolts are to have washers at both the head and nut ends. All connection hardware is to be galvanized steel.
- h. ***Marina Utilities:*** Potable water and electricity may be provided to each berth. Both utilities should be provided to the berth at the same location. Manufactured power pedestals, if used, are to incorporate electrical outlets, low-level lighting with automatic darkness sensors, and electrical metering capability. Electricity is to be grounded and isolated from water. Electricity voltage should be relative to the needs of the boats serviced, as well as the electricity supplied by the local utility company.



Fishing dock at Glen Canyon National Recreation Area, Arizona.

Water is to be supplied by a hose bib fitted with a backflow preventer. Water lines are to be flexible, smooth bore, and pressure rated. The water supply system is to have positive drainage or fittings for blowing water out of the system in winter. The water supply line system is to incorporate a main shutoff valve where the dock piping system joins the water supply. The dock water supply system is to include a drain line. If water pressure to the docks is over 40 psi, a pressure-reducing valve is required. It is recommended that any individual sewage hookups be designed to meet applicable codes.

Individual sewage hookups are rarely provided and require special design. If these services are to be provided, the designs should be developed by a registered design professional and should comply with all design codes.

- i. **Utility Chase:** Ideally, water lines and electricity should be enclosed in a separate, solid-sided floating chase. The chase is intended to float independently of the dock.
- j. **Land-Based Comfort Stations:** All marinas are to have adequate comfort station accommodations. A minimum of four water closets is required for every 100 boat slips. Comfort stations should be located between the marina and its parking lot, within 500 feet of the high water mark of any pier. However, when marinas are located on waters with high annual water level fluctuations, it is acceptable for facilities onshore to exceed the distance requirement.

- k. ***Floating Comfort Stations/Pump-Out Facilities:*** Floating comfort stations/pump-out facilities should be located in areas that provide easy access for the boating public and sufficient clearance for servicing vessels. For best results, the remote facilities should be located adjacent to the main channel, in an area protected from exposure, prevailing winds, and heavy boating traffic. Appendix E - Boating Facilities includes three representative drawings from a complete set of drawings of a floating comfort station and a trailer. However, the comfort station is not wheelchair accessible and must clearly display signs as such. All of the sheets in the drawing set are available electronically.
- l. ***Fuel Dock:*** Fuel distribution system docks should be located on a separate dock on the perimeter of the marina. The minimum width of the dock is to be 12 feet, and the dock should be long enough to service at least two vessels at a time. The fuel storage tanks are to be located onshore and as close to the dispensing station as possible. Fuel tanks are to be set in concrete boxes. The dispensing station is to include hose reels. Shutoff valves are required at a minimum of four locations along the fuel distribution line, as follows: (1) at the dispensing unit, (2) 50 feet from the dispensing unit, (3) at the shore end of the piping system, and (4) at the storage tanks. Check valves are also required in the system, as well as a fuel relief system for the fuel lines between the dispenser and the shore. All fuel-dispensing facilities must be equipped with containment buoys and petroleum absorbing pads. Fueling docks require a permit and strict compliance with codes.
- m. ***Fire Suppression System:*** Water for firefighting is to be provided within 500 feet of any point on the marina. Mooring and fire alarm systems are required, as well as fire protection and suppression systems. The fuel dock is to be protected by a wet and/or dry pipe firefighting system. Provisions for firefighting must conform to the regulations, standards, recommendations and requirements National Fire Protection Agency, 303, "Marinas and Boatyards."
- n. ***Service Dock:*** Service docks at the marina should be located adjacent to a land area that can accommodate land-based cranes and service shops. The service dock should be 12 feet wide. All utility lines to the service dock are to be heavy duty. Fendering at the service dock should be extra heavy.
- o. ***Sewage Pump-Out Facilities:*** Sewage pump-out facilities should be located at each berth or at a location close to the fuel dock. If a single sewage pump-out facility is to be provided, one pump should be provided for every 100 recreational slips. All sewage pump-out facilities must be equipped with containment buoys.
- p. ***Marina Accessibility:*** Accessibility at a marina focuses on three main areas of consideration: (1) parking, (2) toilet facilities, and (3) gangway access to dock systems. Accessible parking spaces are to be the closest spaces to the activity the parking lot serves and are recommended to be within 300 feet of that

activity. If this is not possible, a dropoff area should be located within 100 feet of the activity. Gangways are to conform to requirements of UFAS and ADAAG.

2. **Boat Launching Ramps.**—Boat launching ramps should be located in areas free of wave action and cross currents (if possible, where the maximum wave action is approximately 6 inches high). Ramps should be oriented perpendicular to the shoreline, or angled slightly downstream if there are currents. In addition, boat launching ramps should be oriented at an angle to the main approach road so that vehicles on the road must make a turn to use the boat ramp. This will decrease the likelihood of a driver unwittingly driving down the boat launching ramp at night and into the water. There must be adequate signs indicating the presence of the boat launching ramp at the turn to the ramp.

In high-use areas, multiple launching lanes are recommended, and the number of lanes will be determined by daily use. Single lanes should be a minimum of 15 feet wide. When courtesy docks are used between lanes, the width of the ramp should be increased by the width of the courtesy dock(s), and the clear travel width of the lane should be a minimum of 15 feet. Ramps should be long enough to extend from 2 feet above the highest water level to 3 feet below the edge of the water at the lowest seasonal use water surface elevation. Boat launching ramps are to have a longitudinal slope of 12 to 15 percent. The optimum grade is 12.5 percent. The concrete should have a surface treatment that drains sand and water and provides good vehicle traction. Refer to States Organization of Boating Access (SOBA) guidelines for ramp surface treatments.

On all ramps less than 50 feet wide, a turnaround area 50 feet wide should be provided every 250 feet to minimize trailer backing distance.

A smooth transition with enough vertical curve to avoid trailer hangups is to be made between the approach to the boat launching ramp and the top of the ramp.

Boat launching ramps are to be separated from swimming areas by a minimum of 300 feet. Where designated swimming areas are located adjacent to boat launching facilities, there should be a barrier and warning device between the two areas. The barrier and warning device are to function at all water levels.

3. **Boat Launching Ramps Above and Below Water Line.**—Boat launching ramps should be built in accordance with SOBA and the Portland Concrete Association. (See Appendix E - Boating Facilities).
4. **Floating Courtesy Dock.**—Each lane of a boat ramp should be serviced by an adjacent courtesy dock. If there is one launching lane and one courtesy dock, the dock should be located on the right side of the launching ramp if the driver faces the water. If the ramp has two lanes, the dock is to be located in the center of the ramp. On boat ramps of four lanes or more, docks shall be placed such that there are never fewer than two lanes between adjacent docks or between a dock and the edge of the ramp. Each dock is to have either dock cleats or tie rails bolted to the structure. If

dock cleats are used, the cleats are to be cast galvanized steel and sized appropriately for the boats served. Dock cleats are to be bolted (not screwed) to the structure. The dock should be a minimum of 6 feet wide and long enough to extend at least 3 feet into the water. Docks should be designed with sufficient strength to carry a live load of 20 pounds per square foot and a wind load of 15 pounds per square foot. Docks are to have a nonskid surface.

- 5. Sliding Courtesy Dock.**—A sliding courtesy dock can be placed on an existing boat launching ramp and moved uphill or downhill as needed to meet changing reservoir water levels. The dock is removed or placed at high water at the end of the season or when the reservoir begins to freeze over.

Docks should be a minimum of 6 feet wide, extend at least 3 feet into the water, and have a nonskid walking surface. Fiberglass grating or plastic lumber is recommended for use on the top and on the sides. Wood is not recommended because of the maintenance required.

Appendix E includes two representative drawings from a set of drawings of an inclined dock with guiding boat ramp, designed for the Lahontan State Recreation Area in Nevada by Nevada Division of State Parks. The drawings are useful as a guide only; the details need to be adjusted for any site conditions encountered in a specific project. It should be noted that Nevada Division of State Parks assumes no responsibility for use of these plans beyond the original use intended in the construction of facilities at Lahontan State Recreation Area.

- 6. Associated Parking.**—The parking lot servicing the boat ramp should be sized to accommodate the turnover rate of the lake. It is recommended that a high turnover area have 20 to 30 parking spaces per launching lane, and a low turnover area have 30 to 50 parking spaces per launching lane. The parking lot should be of a pullthroughs design, with stalls set at 45 degrees. Parking spaces should be 12 feet wide by 55 feet long for cars with trailers, and 10 feet by 20 feet for cars without trailers, except for accessible spaces, which are to be a minimum of 16 feet wide and 20 feet long. The parking lot should feature a 50-foot inside turning radius throughout, 14-foot-wide one-way drive lanes, and 30-foot-wide two-way drive lanes. The parking lot should be sloped 1.5 percent, so drainage will flow away from the boat ramp. The parking lot is to comply with UFAS and ADAAG.

Where possible, the parking lot should be located near the ramp, with all parking spaces within 600 feet of the top of the launching ramp. Car-only parking areas should be separated from car-trailer parking, if possible.

Boat-ready and tiedown areas, or rigging and derigging areas, should be provided along the route to and from the launching ramp. These areas should be 12 feet wide and a minimum of 120 feet long, striped in yellow, and designated with signs.

Restrooms should not be located at the top of the boat ramp, but generally within 200 feet of the top of the ramp.

No overhead power lines are to be located over the parking area, launching ramp, approach roads to the ramp, or any other areas where a vehicle towing a boat trailer loaded with a fully rigged boat can travel.

7. **Boat Ramp Accessibility.**—Accessibility at a boat ramp focuses on three main areas of consideration: (1) parking, (2) toilet facilities, and (3) boat ramp/dock systems. Accessible parking spaces are to be the closest spaces to the activity the parking lot serves and are recommended to be within 300 feet of that activity. If this is not possible, a dropoff area should be located within 100 feet of the activity. Boat ramps are to conform to requirements of UFAS and ADAAG.

G. Fishing Facilities: New or rehabilitated fishing facilities built by Reclamation shall be accessible and comply with the standards in UFAS and ADAAG. (See Appendix F - Fishing Facilities.)

H. Foot Trails: Foot trails at Reclamation sites are to function primarily as paths connecting recreation facilities. The primary users are expected to be pedestrians traveling short to medium distances. Trails should be designed to connect one facility element to another with the least amount of environmental impact. As such, trails are to be sited to minimize soil erosion, damage to vegetation and wildlife, degradation of streams, cost of maintenance, and circulation conflicts between pedestrians and vehicles, while maximizing user safety and esthetic experience.

1. **General Layout Criteria.**—Trails should be designed to avoid the following areas:

- Where there are threatened or endangered species
- Where there is critical or sensitive habitat
- Where there are wetlands or permanently soggy soil conditions
- Where a trail would cause increased soil erosion, such as on excessively steep slopes

A trail may cross a wetland for the specific purpose of interpretation, and a trail may cross a wetland if the trail is raised on a walkway above the ground (for short distances only.) Trails should be aligned to avoid crossing roads, except very low-volume roads that service local circulation. If crossing a road is necessary, adequate and clearly visible signs must be posted on the road to give drivers approaching from either direction adequate warning of the crossing. When possible, trails should be aligned to avoid crossing streams. However, if crossing streams is necessary, the trail should be contained on a footbridge or other raised crossing facility. When a stream is crossed, the trail should be hard surfaced for 10 feet past the point of high soil moisture. If trails are located in wetlands or sensitive areas for the purpose of interpreting those landscapes, the trail should be raised and handrails should be incorporated on sections that are more than 30 inches off of the ground.

To minimize soil erosion, trails should be located in areas that favor:

- Coarse or gravelly soil rather than clay and silty soil
- Vegetation composed of grasses rather than forbs or shrubs
- The toe of a slope rather than a side slope
- Flat slopes rather than steep slopes
- Low soil moisture rather than high soil moisture
- South and west exposures rather than north and east exposures

Surveying tools should be used to determine final alignment and grades; grades are not to be determined solely on visual judgement.

Foot trails are to include any short spurs that are necessary to access nearby destination points, in order to provide logical site circulation. Trails should be clearly marked and signed at access points, and distances to destinations should be posted.

2. Design Criteria.—

- a. ***Gradient:*** Trail grades should be no more than 10 percent and, preferably, less than 7 percent. On slopes over 25 percent, steps should be used, but only for short stretches. (See Appendix G - Trails.) Trails should be cross-sloped to drain at not less than 2 percent or more than 4 percent. Switchbacks should be as level as practicable.
- b. ***Trail Width and Surface Material:*** Trails should be sized and surfaced to accommodate their expected level of use and to minimize soil erosion and vegetation trampling. Connecting trails that link nonlocal destination points that are a considerable distance apart should be 18 to 24 inches wide. These trails should be soil surfaced. In localized areas where the soil cannot support foot traffic, the trail should be surfaced with compacted decomposed granite or aggregate base course (class 6.) If foot traffic on these trails is very heavy, the entire length of the trail should be surfaced with compacted aggregate base course. (See Appendix G - Trails.) In extremely heavy use areas, the trail should be paved with an accessible surface or concrete. Local trails within a campground or marina area should be a minimum of 60 inches wide and surfaced with decomposed granite or aggregate base course.

Boardwalks over wet areas and footbridges should be a minimum of 60 inches wide and include handrails on both sides. Railings are required for bridges higher than 30 inches off the ground and should be designed to meet codes and comply with UFAS and ADAAG. Footbridges on accessible trails are to be accessible and should include edge protection for security of wheelchairs at any turnouts. (See Appendix G - Trails.)

3. **Accessible Trails.**—All trails on Reclamation sites that are designated as accessible are to comply with UFAS and ADAAG.

I. Recreation Area Roads:

1. **Internal Vehicular Circulation.**—Reclamation should use the design standards for roads established by the U.S. Army Corps of Engineers and set forth in *Design of Recreation Areas and Facilities - Access and Circulation*. Consult that publication for a complete description of road layout and circulation criteria.

The preferred layout of a recreation area is one that features a main access road with secondary side roads. The side roads may lead to campgrounds, service or administrative areas, a trailer dump station, or other site amenities such as boat launching ramps. To minimize traffic through the campground, circulation throughout the recreation area should be designed to ensure that day-use facilities do not share the same roads with campground loops. Gates should be sited along the main access road so that all side roads may be closed, while allowing any combination of other roads to remain open. (See Appendix H - Recreation Areas Roads and Utilities.) Refer to the *Manual of Uniform Traffic Control Devices* for reflective warning symbols.

If possible, the main road for a campground should be located along an uphill edge of the site, with campground loop roads located between the main campground road and any focal landscape feature (such as a water body.) This layout minimizes unnecessary vehicular traffic on the loop roads and vehicle/pedestrian conflict between campsites and the shoreline.

2. **Design Criteria.**—Reclamation adopts the road standards established by the U.S. Army Corps of Engineers and set forth in *Design of Recreation Areas and Facilities - Access and Circulation*. Consult that publication for a complete description of road design criteria. Reclamation recreation roads typically should be designed to be two-way, two-lane, gravel or asphalt paved roads. Driving lanes should be 12 feet wide, and shoulders should be a minimum of 1 foot wide, gravel or asphalt. Where traffic is very heavy, the need for additional driving lanes should be evaluated. Grades on roads should be as level as possible, while allowing for positive drainage. Roads should be planned carefully to preserve major trees and clumps of vegetation, while considering safety factors. Campground roads should be one-way roads that are 14 feet wide. Shoulders should be a minimum of 1 foot wide, gravel or asphalt.
3. **Parking Lot Design Criteria.**—Reclamation should use the standards presented by SOBA in its *Handbook for the Location, Design, Construction, Operation, and Maintenance of Boat Launching Facilities*, and *Guidelines for the Design of Barrier-Free Recreational Boating and Fishing Facilities*, except where larger spaces are described in this document.

Recreation Facility Design Guidelines

4. **Parking Spaces.**—Parking spaces for cars should be a minimum of 10 feet wide and 20 feet long.
5. **Accessible Parking Spaces.**—All accessible parking spaces are to comply with the requirements of UFAS and ADAAG. (See Appendix H - Recreation Area Roads and Utilities.)

J. Utilities:

1. **Power Lines.**—Whenever possible, power lines are to be buried underground. All power lines shall meet applicable codes.
2. **Water Lines and Sewer Lines.**—New or replacement water lines and sewer lines should be made of high-density polyethylene.
3. **Above-Ground Propane Storage Tanks.**—Above-ground propane storage tanks should be located above the expected high water line of the reservoir. Above-ground tanks should be enclosed by a 6-foot-high visually impenetrable fence or wall that has a 12-foot-wide sliding gate with easy service access. Any other above-ground storage tank that is not enclosed with a solid fence or other screen should be painted to match the surrounding landscape. In addition, a solid vegetative screen may be planted.
4. **Underground Fuel Storage Tanks.**—Refer to Reclamation Manual Directives and Standards ENV 02-01, Underground Storage Tank Management.

K. Wildlife Observation Blind:

1. **Siting Considerations.**—The ideal location for a wildlife observation blind is on the southeast, south, or southwest bank of a water body. This is because the sun shines directly on the viewing subject most of the year. A blind could be situated on the north bank of a water body, but viewing and photographing would not be ideal, except in summer, because of the sun angle. In addition, wildlife tend to be more active at dawn and at dusk when the lighting is from the southeast and southwest. If possible, the blind should be located reasonably near masses of vegetation that attract wildlife for shelter, food, or nesting reasons, yet not close enough to disturb the animals with human activity.

Wildlife is adaptable and mobile. If a favored tree should fall down, animals, especially birds, may move on to a new site. For this reason, any new structure should be sited so that it is valuable for viewing wildlife in more than one small area of the habitat, such as a single tree.

The approach to the blind should be well screened so that visitors do not flush the wildlife. The approach could be hidden by the blind itself or by some other screen, such as tall vegetation. In addition, the approach to the blind, and the blind itself, must be accessible.

2. **Design Considerations.**—In areas where vandalism and security are issues, an open design is best, with the blind open to the approach so that it can be viewed by the staff. If the opening is to the south, the orientation can take advantage of solar heating to melt snow in the winter and provide protection from prevailing north winds. (See Appendix I - Wildlife Observation Facilities.)

If the blind is to accommodate larger groups of visitors, it should be a minimum of 250 square feet and provide seating for groups of 20 people. Seating should accommodate groups of four to six people per bench, and several seating locations should be available. The main screen wall of the observation blind should offer viewing from both vertical and horizontal windows at various heights including those that comply with UFAS and ADAAG. Locations for interpretive signs should be provided and comply with UFAS and ADAAG.

The blind should have a roof. Wherever the floor of the blind is more than 18 inches above the adjacent grade and unprotected by a wall, there should be a 30-inch minimum railing for safety. The building material selected for the blind should blend into its surroundings as well as possible, in form, line, texture, and color. See Chapter IV, paragraph K., “Colors for Shelters, Tables, and Buildings.”

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